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CIRCULAR NO. 76

BITUMINOUS COAL MOVEMENTS IN THE
UNITED STATES

BY

WALTER H. VOSKUIL

REPRINTED FROM GEOGRAPHICAL REVIEW
VOL. XXXII, No. 1, PP. 117-127, JANUARY 1942
PUBLISHED BY THE AMERICAN GEOGRAPHICAL SOCIETY OF NEW YORK



PRINTED BY AUTHORITY OF THE STATE OF ILLINOIS

URBANA, ILLINOIS

1942

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ALTHOUGH COAL RESERVES are found in 31 states in the Union east and west of the Mississippi River, more than four-fifths of the present day production is concentrated in six states in the Appalachian field and the Illinois-Indiana-Kentucky fields. In fact, the location of the centers of production shows little relation to the location of the coal reserves. The Western States in which production and consumption are almost negligible, have two-thirds of the reserves. On the other hand, the bulk of high-quality coking coal occurs in a restricted area within the Appalachian field, and the so-called "smokeless" coals, which found such preference in domestic heating, are not widely duplicated outside of southern West Virginia.

INTERNAL DISTRIBUTION SURVEYS

Important coal-consuming areas lie outside the important producing areas—New England and the states of the Upper Mississippi Valley, for instance—so that considerable movement of the commodity is necessary. Other long-distance movements of coal result from a demand for coal of special quality, such as the demand by domestic fuel users in the Middle West for the low-volatile coals of West Virginia or the demands of the iron industry of the lake ports for coking coal from the fields of eastern Kentucky and southern West Virginia fields.

The factors underlying the distribution of coal from producing field to consuming market are the least known of the elements of the coal industry in the United States. Reasonably comprehensive data are available only for the years 1915, 1917, 1929, and 1937.

Distribution surveys have been made in the past when a national emergency or an

unusually difficult economic condition of the coal industry made such a survey seem desirable. The first report of distribution and consumption was prepared for the year 1915 by C. E. Leshner, geologist in charge of coal statistics for the United States Geological Survey, and was published in the annual report on mineral resources.¹ Two years later a similar report was prepared for the United States Fuel Administration.² A third survey, for the year 1929, was undertaken by the Coal and Coke Division of the United States Bureau of Mines under the direction of the late F. G. Tryon.³ An unusually detailed report⁴ of coal movement from producing fields and districts⁵ to market areas⁶ within each state, was prepared for the year 1937 by the Bituminous Coal Division of the United States Department of the Interior. This is the first de-

¹ Mineral Resources of the United States, 1915, pt. II, U. S. Geol. Survey, pp. 433-513, 1917.

² Mineral Resources of the United States, 1917, pt. II, U. S. Geol. Survey, pp. 1203-59, 1920.

³ Published as mimeographed reports in part of the Monthly Coal Distribution Reports of the U. S. Bureau of Mines.

⁴ All-Rail Shipments of Bituminous Coal Exclusive of Railroad Fuel as Reported on Forms D-1 and D-3 for Calendar Year 1937 and Realization Obtainable Thereon from Proposed Coordinated Minimum Prices. Interim Summaries by Market Areas—Market Areas 15-75, and 153-157. Pt. I, District Nos. 1-8; Pt. II, District Nos. 9-15. U. S. Bituminous Coal Division, Exhibit No. P-502, Pts. I and II, Aug. 13, 1939.

Lake Shipments of Bituminous Coal from Ports on Lake Erie to Destinations in Market Areas Nos. 10, 12, 13, 15, 20, 21, 29, 30, 41, 42, 43, 44, and 45; Also to Destinations in Market Area No. 4 West of the Port Maitland Line, Calendar Year 1937. U. S. Bituminous Coal Division, Exhibit No. P-504, Aug. 15, 1939.

Truck Shipments of Bituminous Coal as Reported on Forms D-1 and D-2 and D-3 for Calendar Year 1937 and Realization Obtainable Thereon from Proposed Coordinated Minimum Prices. Districts 10, 11, 12, 14 and 15—Interim Summary—Truck Coal. U. S. Bituminous Coal Division, Exhibit No. P-508, Aug. 15, 1939.

Rail Shipments Inland from the Upper Lake Docks to All Market Areas. Compiled from Rail Carrier Records, 1937. U. S. Bituminous Coal Division, Exhibit No. P-669, Sept. 25, 1939.

⁵ As defined in Section 4 of the Bituminous Coal Act of 1937 (75th Cong., 1st Sess., H. R. 4985 [Public. No. 481]).

⁶ As outlined by the U. S. Bituminous Coal Division, in the *Federal Register* for May 4, 1939.

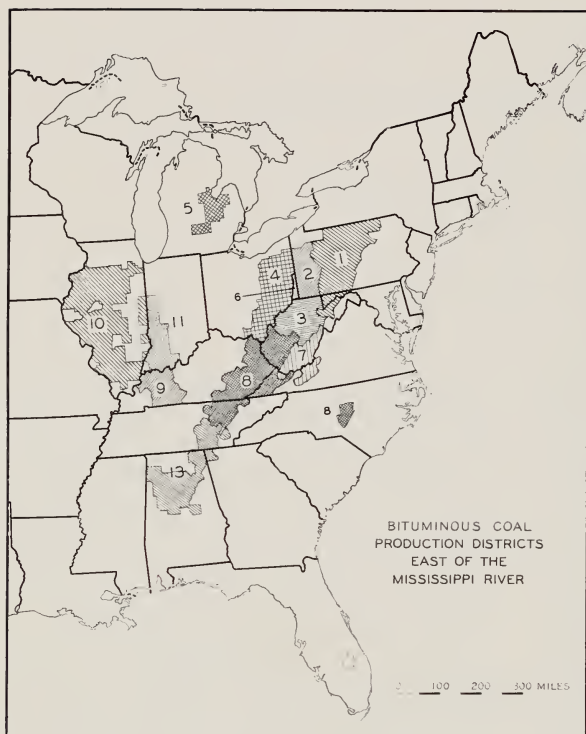


FIG. 1

tailed distribution report that has been made since 1929 and may be regarded as representative of the structure of the coal market at the present time.

This 1937 series includes data on all-rail shipments, truck shipments, and tidewater, lake cargo, and river cargo coal, also distribution by sizes and uses of by-product, bunker, and all other coals. By-product coal includes coal used in by-product coke and retort ovens and in the manufacture of water-gas. Coal used as railroad fuel was excluded from the 1937 reports because it is impossible to allocate such coal to any particular market area.

In addition to these surveys for given years, a monthly coal distribution report is published that is more restricted in scope.

The market radius for coal from each of the main producing districts is determined by numerous factors involving differences in the quality of the coal, needs of consumers, production and transportation costs, and promptness of delivery. Because of the bulkiness and low value of coal, the market tends to be localized, except where low-cost transportation, such as exists on the Great

Lakes or along the Atlantic coast, is available. The freight-rate structure in conjunction with differences in production costs also has affected the market areas for competing coal producers. Differences in the quality of the coal of one region as against those of another sometimes lead to marked differences in the length of haul. As a rule, coal of high quality will bear a higher transportation charge than coal of low quality.

This paper attempts to survey briefly the more important long-distance movements of coal in the New England market, the Great Lakes trade, the all-rail westward movement, the markets for coal from the eastern interior coal basin, and special conditions of the Chicago coal market.

The main long-distance movements of coal in the United States are the movement of coal for special purposes, namely coking coal and coal for domestic heating, and the movement to important industrial areas devoid of local coal supplies.

NEW ENGLAND BITUMINOUS COAL MOVEMENT

The fuel requirements of the New England market are mainly coal for domestic heating and for industrial power and heat and, in smaller quantities, public-utility fuel, railroad fuel, and by-product coal for coke ovens and gas works. These fuel requirements, exclusive of automotive fuel, are met by the importation of bituminous coal, anthracite, and fuel oils. For a representative fuel year, 1937, the distribution of these fuels was approximately as follows:

| | |
|-----------------------------------|--------------------|
| Bituminous coal | 17,000,000 tons |
| Anthracite | 5,000,000 tons |
| Fuel oil, including range oils | 40,931,000 barrels |
| Equivalent coal | 10,230,000 tons |

Both northern and southern Appalachian fields contribute to supply the bituminous-coal requirements of the New England market. Except for the anthracite obtained by all-rail haul from Pennsylvania, the eastern section of New England (market area No. 1) is supplied almost exclusively by producing districts 7 and 8 in Virginia, West Vir-

ginia, and eastern Kentucky, by rail-tidewater haul.

Movements of coal from producing districts in the northern and southern Appalachian fields into market area No. 1 (eastern New England) and No. 2 (western New England and parts of the Middle Atlantic States) are shown in figure 2 and table 1.

The problem of maintaining an adequate flow of fuel to New England is intimately related to the present crisis in ocean transportation. Wherever possible the railroads are carrying cargoes hitherto transported by coastwise carriers, so that water carriers can be made available for more urgent defense service. This may mean a curtailment of tidewater coal services to New England and a greater dependence upon the all-rail route. Under existing freight rates and f. o. b. mine prices, this will result in a slight increase in coal prices in producing districts 1 to 3, provided rail facilities continue to be adequate for the increased load. A transportation shortage in both rail and water services would be serious indeed.

LAKE CARGO MOVEMENT

In figure 3 is shown the movement of lake cargo coal. This movement has grown consistently in importance and at the present time runs from 40 to 45 million tons yearly. Both the northern Appalachian fields (Pennsylvania, the Panhandle of West Virginia, and Ohio) and the southern Appalachian fields (West Virginia and eastern Kentucky) contribute to this movement, but the southern fields are by far the more important. The Pennsylvania coal districts have a large home market, whereas West Virginia and eastern Kentucky have only relatively small local coal-consuming industries.

This long-distance movement of coal from the Appalachian districts to Upper Lake States is a consequence of an unusual combination of special market requirements and low-cost water transportation over part of the distance. A return cargo of iron ore from Upper Lake docks to coal ports on

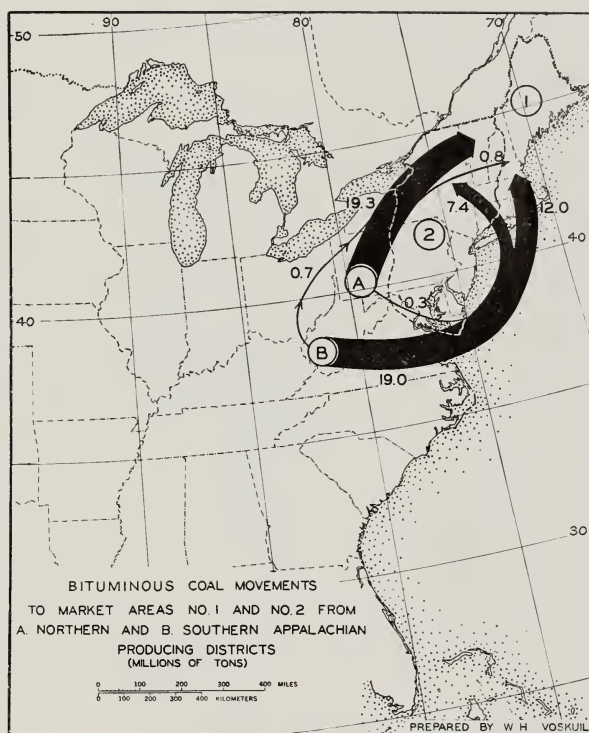


FIG. 2

TABLE 1.—NEW ENGLAND COAL MARKET, 1937:
SHIPMENTS TO AREAS 1 AND 2

| <i>All rail from</i> | <i>to AREA No. 1</i> | <i>to AREA No. 2</i> |
|----------------------------|--------------------------|--------------------------|
| District | <i>Tons</i> | <i>Tons</i> |
| 1..... | 589,659 | 10,190,733 |
| 2..... | 70,553 | 3,202,118 |
| 3..... | 125,240 | 5,067,066 |
| 6..... | | 59,758 |
| 7 (Low-vol.)..... | 6,056 | 293,102 |
| 7 (High-vol.)..... | | 606 |
| 8 (Low-vol.)..... | 51 | 7,436 |
| 8 (High-vol.)..... | 4,548 | 417,284 |
| <i>Tidewater coal from</i> | | |
| Hampton Roads | | |
| (Dists. 7 and 8)... | 11,743,783° | 7,232,196* |
| Philadelphia | | |
| (Dists. 1, 2, 3, 8)... | 145,055° | |
| New York | | |
| (Dists. 1 and 2)... | 144,579° | |
| New York | | |
| (Dists. 1, 2, 3).... | | 101,893* |

° Includes railroad fuel and captive coal.

* Includes railroad fuel and captive coal. Does not include bunker and intraport movements inside the capes of Delaware and Chesapeake Bay, except from Hampton Roads to Sparrows Point.

Lake Erie further contributes to the efficient use of transportation equipment and the reduction of lake rates.

Coal shipped over the Lakes falls into three general use categories: by-product coal, steam coal, and domestic fuel. Approximately 4 million tons of by-product coal moves into the Chicago area. This movement is strictly non-competitive, since coals from Illinois, Indiana, and western Kentucky districts are not acceptable by the industry for the manufacture of metallurgical coke. The remaining coal, including railroad fuel, and the domestic fuel, is destined to ports in lower Michigan, and for Lake Michigan and Lake Superior ports in Wisconsin, Michigan, Minnesota, and Ontario, Canada. The total movement to American ports west of Detroit is approximately 27 million tons, of which 20 million tons is used in ports of unloading or for railroad fuel and 7 million tons is shipped by rail beyond lake ports to interior destinations. Coals from Illinois and Indiana cannot compete with Eastern coals in the lake ports; they approach a competitive position only in interior points of southern Wisconsin and Minnesota.

Chicago and Minneapolis are critical market areas for competition between all-rail and lake-borne coal. In the Chicago market, operators of by-product coking ovens and industrial users located on the edge of the water find it to their advantage to purchase lake cargo coal. For example, the Chicago industrial district (in Illinois) uses about 4 million tons of coking coal annually, of which only about 500,000 tons is received by all-rail haul in contrast with by-product coking plants in Indiana which tend to favor the use of all-rail transportation for their coking-coal supplies. On the other hand, for markets within the city of Chicago away from the lake edge, and thus involving transshipment by rail or truck, it appears to be more economical to ship coal by all-rail haul from the Appalachian fields.

Lake cargo unloadings in Lake Michigan ports above Chicago and in Lake Superior ports are consumed almost entirely in Wisconsin and Minnesota. Not more than one-tenth of the dock unloadings are transshipped as far as Iowa, the Dakotas, or Nebraska. A large part of the tonnage is consumed in port cities without further transshipment by rail.

In recent years attempts have been made

TABLE 2.—LAKE CARGO SHIPMENTS, 1937

| Destination | | Tons |
|----------------|-----------------------|-----------|
| District No. | Name | |
| 10, 12, 13, 15 | Ohio | 342,659 |
| 20 | Northern Michigan... | 1,665,217 |
| 21 | Southern Michigan... | 6,827,401 |
| 29 | Chicago | 4,364,718 |
| 30 | Michigan City, Ind... | 2,056 |
| 41 | Waukegan, Ill..... | 184,717 |
| 42 | Southern Wisconsin... | 3,812,971 |
| 43 | Northern Wisconsin... | 3,177,743 |
| 44 | Michigan | 1,895,918 |
| 45 | Duluth..... | 9,411,364 |

to utilize the Illinois and Upper Mississippi Waterways for barge transportation of coal to points in the Upper Mississippi Valley. The movement has been attended with considerable success on the Illinois waterway from central Illinois coal fields to Chicago and Marseilles, but on the Upper Mississippi River it is still experimental. These water routes should, however, be regarded as potential means of transportation of coal from Illinois in the event that coal-car and locomotive use on railroads must be conserved.

ALL-RAIL WESTWARD MOVEMENT OF COAL

West of the Appalachians, beyond the industrial cities of western Pennsylvania and Ohio, in the Upper Mississippi Valley, is a large and diversified market for coal supplied by producing districts both in the Appalachian province and the eastern interior coal province of Illinois, Indiana, and western Kentucky. This market territory comprises mainly the states of Illinois, Indiana, Michigan, and Iowa, interior Minnesota and Wisconsin, and the eastern cities of Kansas, Nebraska, and the Dakotas. Its boundaries are determined by competition from other coal fields and other forms of fuel. In the southwestern part, fuel oil and natural gas dominate the market almost to the exclusion of coal. The westward movement of Illinois and other interior coals into the 100th meridian states is met by an eastward movement of coal from Colorado, Wyoming, and Montana, though in small quantities. In the lake-shore counties of Wisconsin and Minnesota the market is dominated by Appalachian coals carried cheaply over the Great Lakes and reaching the ports of Lake Michigan and the head of Lake Superior.

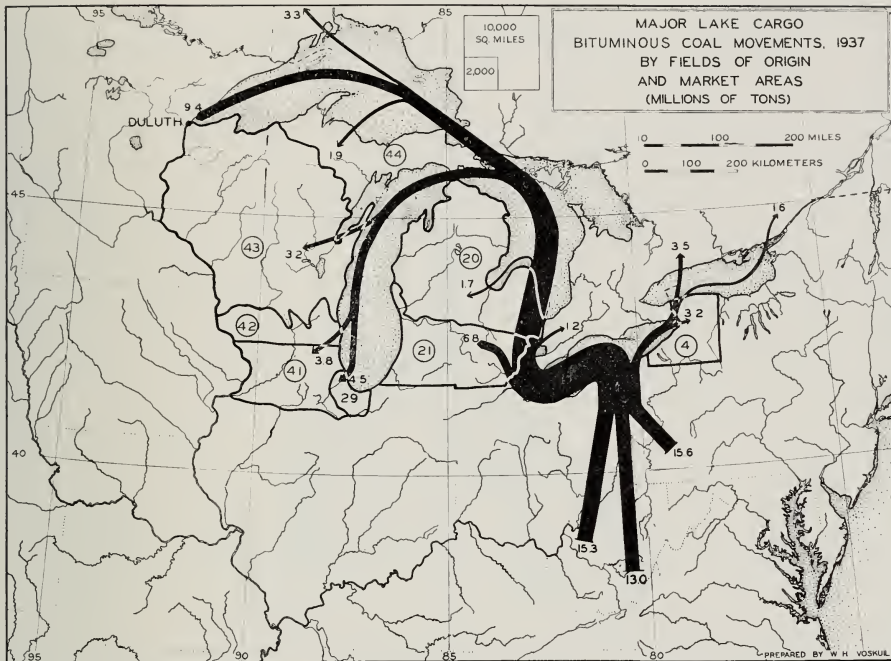


FIG. 3

Although producing districts in all states of the Appalachian coal provinces—Pennsylvania, Virginia, West Virginia, eastern Kentucky, and Ohio—contribute to fill the requirements of this area, by far the bulk of the supply comes from two producing districts in southern West Virginia and eastern Ohio: the low-volatile producing district No. 7 of southern West Virginia and district No. 8 of West Virginia and eastern Kentucky.

The all-rail shipments of bituminous coal into this large market area, are of three distinct types; coking coal, domestic fuel, and industrial fuel. The first two are supplied mainly or exclusively by Appalachian fields; the third is supplied dominantly by the Illinois-Indiana-western Kentucky districts.

DOMESTIC FUEL IN UPPER MISSISSIPPI VALLEY STATES

Figure 4 shows the distribution of low-volatile coal for other than by-product use in states in the upper Mississippi Valley in addition to that entering the Chicago market. The movement of fuel for domestic use from southern Appalachian fields to consumers in the upper Mississippi Valley as shown in figures 4 and 5, offers one possibility of economizing on transportation

equipment in the event that the movement of war materials imposes a serious burden upon existing transportation facilities. Coal-producing districts in Illinois, Indiana, and, to a smaller extent, western Kentucky, are in a position to supply this market adequately. This is particularly true if the mines should be put into operation during the summer season, when they are now largely idle. Although the coal is of poorer quality, nevertheless, in an emergency this difference with its attendant disadvantages must be accepted; furthermore the shorter haul would tax the railroad facilities proportionately less. Producing districts in Illinois, Indiana, and western Kentucky supply, in addition to part of the domestic market, the larger part of the industrial, public utility, and railroad market of the Upper Mississippi Valley.

CHICAGO COAL MARKET

Of particular interest is the movement of coal into the Chicago market. This is the largest coal market in the United States, and possibly in the world. In this particular market, the coal received from Appalachian fields (Dists. 7 and 8) is mainly for by-product use and for domestic consumption. The principal coal movements to Chicago are shown in figure 5.

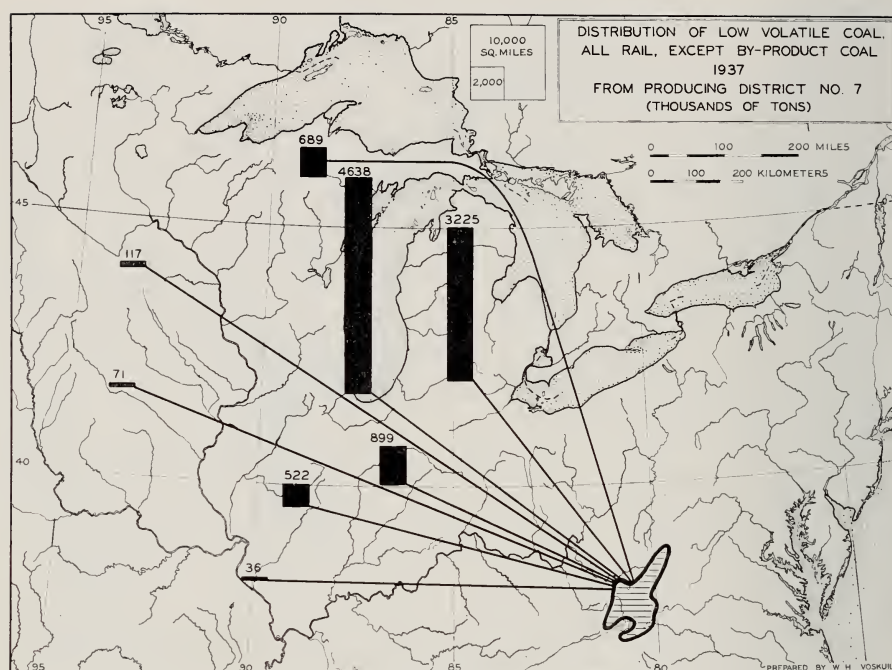


FIG. 4

The use to which the coal is put markedly influences the selection of the transportation route. Coal for by-product ovens is moved more economically over the lakes than by all-rail haul. This coal is composed of screenings, which suffer little further degradation from the rough treatment incident to the several loadings and unloadings in the rail-lake haul. Moreover, consumers of by-product coal are located on lakeside docks or in the Calumet channel, where transfer from lake steamer to coke-oven bin is direct.

Coal for domestic use from the low-volatile fields (District 7) is moved more economically by all-rail haul. Prepared sizes are required, which, in the case of Pocahontas coal, suffer severe degradation by rail-lake haul. In this case, re-screening would be necessary, with a substantial loss of domestic-class coal. Secondly, the season of domestic demand does not fit into the lake navigation season, so that storage by distributors would be required. Finally, the domestic market is in the interior of the city and the outlying suburbs; hence lake-borne coal would still require an additional rail haul to retailers' yards. Under these conditions, coal shippers dealing in the do-

mestic trade have found all-rail haul the only satisfactory means of supplying this market.

Of the quantities listed in table 3, the coal received by lake cargo consists of small sizes of low-volatile by-product coal destined for use in by-product coke manufacture; it does not compete with coal from Illinois.

TABLE 3.—COAL SHIPPED INTO CHICAGO MARKET, 1937

| Origin | Tons |
|---|------------|
| Dist. 1 (Central Pennsylvania) | 19,431 |
| 2 (Western Pennsylvania) | 1,568 |
| 3 (Northern West Virginia) | 43,062 |
| 4 (Ohio) | 409 |
| 7 (W. Va. and Va. Smokeless)* | 4,948,098 |
| 8 (W. Va., E. Ky., Tenn. and Va.)** | 3,102,452 |
| 9 (Western Kentucky) | 390,551 |
| 10 (Illinois) | 7,025,705 |
| 11 (Indiana) | 2,205,565 |
| 13 (Alabama) | 156 |
| By lake | 4,364,718 |
| Total | 22,101,715 |

* Includes shipments from low-volatile mines in District 8.

** Includes shipments from high-volatile mines in District 7.

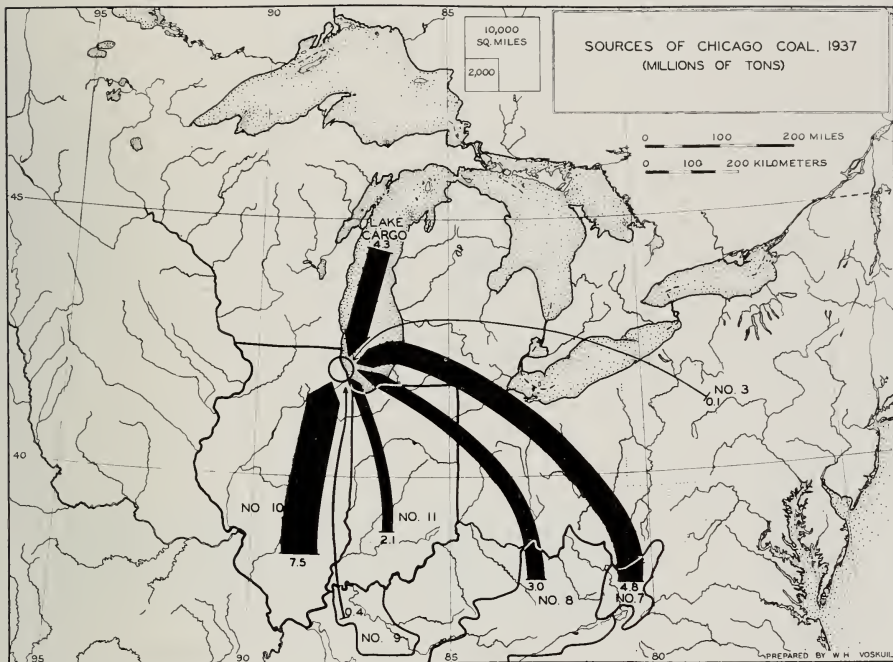


FIG. 5

Coal received by all-rail haul from District 7 (4,948,098 tons) is used in the domestic market, and probably also coal obtained from District 8 (3,102,452 tons) a total of 8,050,550 tons. Out of this total quantity, amounts ranging from 500,000 to 800,000 tons shipped by all-rail are used in the by-product market.

DISTRIBUTION OF COKING COAL

There are three principal districts of coking-coal production in the United States, which together account for 98 per cent of the annual output: central and western Pennsylvania, with extensions into northern West Virginia; southern West Virginia and eastern Kentucky; and Alabama. In 1937, a representative year, these districts produced tonnages of coal as recorded in table 4.

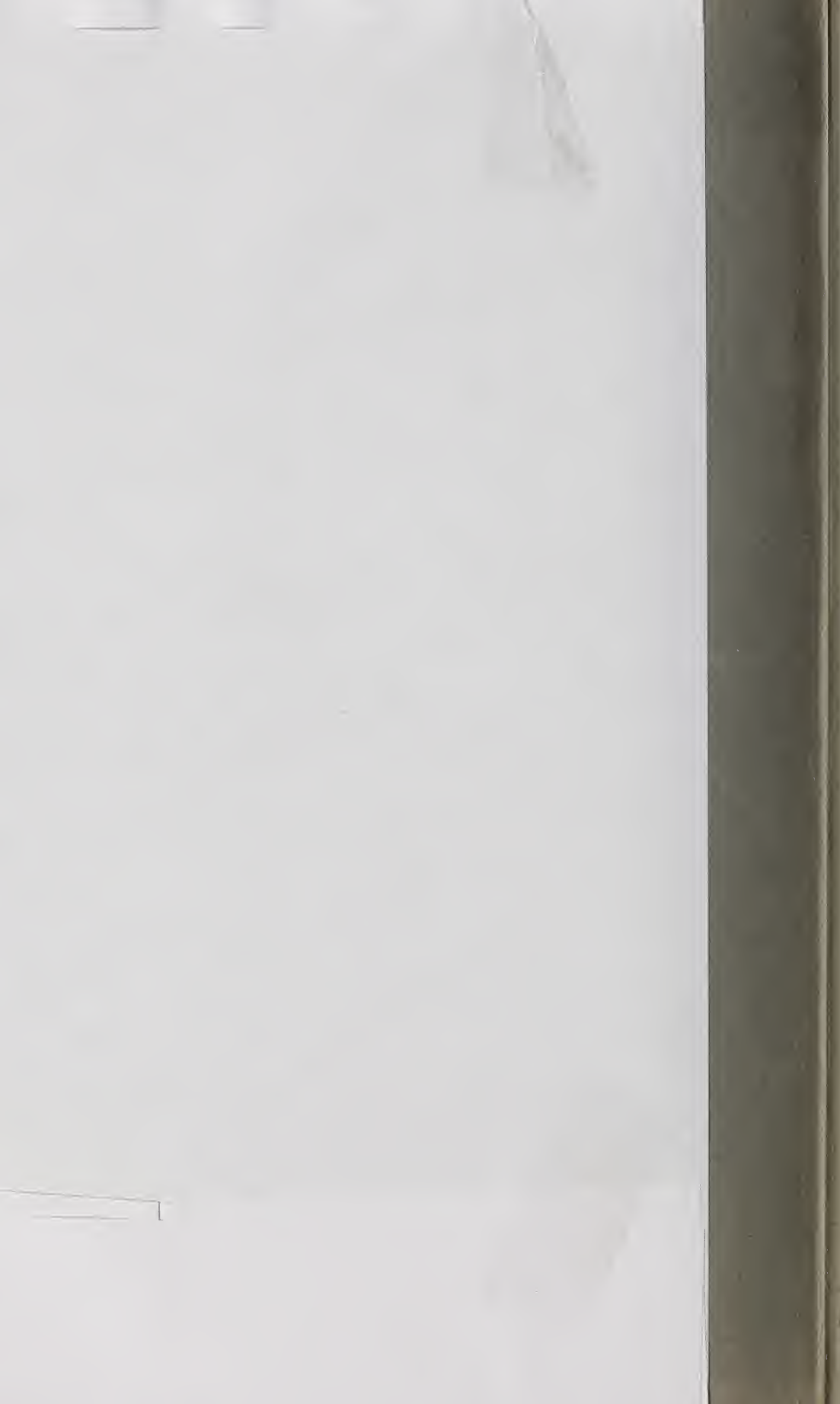
Of this total output of coal used in the manufacture of coke, about half is coked in the mining districts; the remainder is shipped to coking plants that are reached by a railroad or rail-lake haul. The division of markets between the older Pennsylvania fields and the newer southern West Virginia and Kentucky district is particularly noteworthy. In the main, Pennsylvania dis-

trict supplies the steel industries in the Pittsburgh area and in the Mahoning and Shenango valleys and ships smaller quantities to Northern and Western blast furnaces. The principal outlets for West Virginia coking coal districts are in the iron and steel centers of Ohio, Indiana, Michigan, and Illinois. The southern district is also the chief supplier of coal to Lake Erie ports for transshipment to Upper Lake docks. The iron and steel industry of the Chicago area is supplied with coking coal mainly via lake carriers.

TABLE 4.—COAL PRODUCED IN THE THREE PRINCIPAL UNITED STATES COKING-COAL DISTRICTS, 1937

| | Net tons | Per cent |
|--------------------|------------|----------|
| Pennsylvania..... | 33,069,889 | 47.0 |
| West Virginia..... | 29,818,720 | 42.6 |
| Alabama..... | 5,802,869 | 8.3 |
| All others..... | 1,486,499 | 2.1 |
| Total..... | 70,177,977 | 100.0 |

Although large tonnages of by-product coals move in the lake traffic, especially to the Chicago and Waukegan markets, there is also a large all-rail haul to by-product ovens, especially in northern and central Indiana.



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